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Preliminary results on foliage-dwelling spiders on black pine (*Pinus nigra*) by beating on 5 sites in Hungary

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Preliminary results on foliage-dwelling spiders on black pine *(Pinus nigra)* **by beating on 5 sites in Hungary.** - The surveying of foliage-dwelling spiders was carried out at 5 different study-sites in Hungary. The samples were made with beating net. The total number of 2102 spider specimens belonged to at least 71 species. In the studied towns the density and the species diversity of the spider community were lower in the town centres than in the suburbs.

Key-words: foliage-dwelling spiders - black pine - density - species diversity.

INTRODUCTION

Though all spiders are predatory, plants play on outstanding role in the life of many of them. It is a well known and characteristic fact about nearly all plant dwelling spiders which plants they prefer in their habitat selection. Many studies deal with foliage-dwelling spiders of evergreen coniferous trees, too (Balogh 1935, Kolosvary 1933, 1935, Jennings 1987, Gunnarsson 1988, Mason 1992, Szinetar 1992, Knoflach & Bertrandi 1993, Simon 1995).

The black pine (*Pinus nigra* spp. *nigra*) occurs in Central Europe, from Austria to Central Italy and to Greece (Meusel *et al.* 1965). In Hungary, it is planted in different arid and dry biotopes and in towns.

Through the examination of five collecting spots (Map 1), we tried to find answers to the following questions:

1. What species can be found on foliage of black pine?
2. Which are the most typical accompanying species of black pine?
3. Are there differences in the characteristics of the spider fauna in different parts of the country, as well as between the biotops of city-centres and outskirts, and biotops with different environmental loading?

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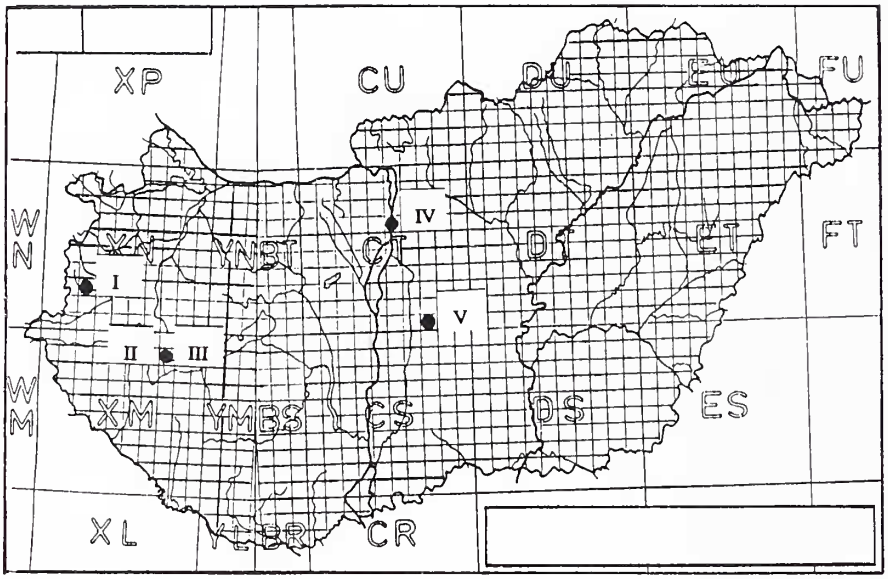

FIG. 1

The study sites in Hungary. I. Szombathely; II. Keszthely; III. Balatongyörök; IV. Budapest; V. Fülöpháza.

MATERIALS AND METHODS

The samples were taken with beating net from foliage 1,5–2 metres high. Ten 70 cm long branches constituted one sampling unit. The density values were calculated on the basis of the ten 70 cm long branches: number of spiders per ten branches.

The index of species abundance (S.ISA) using Kendall's rank-correlation method (KENDALL 1962) has been examined, which, besides the number of individuals of the species considers the number of the sites where the species was found, as well as the position the species occupied in the rank of precedence in some collecting areas.

In a few cases the density and species diversity of the foliage-dwelling spiders have been compared between the city-centres and the suburban areas, as well as the industrial area and the suburbs with gardens. Delete-one jackknifed form of the Shannon-Wiener estimates were calculated (ADAMS & MCCUNE 1979). The significance of diversity differences has been tested by an adequate version of the t-test (IZSAK 1994).

The samples was carried out in five different study sites in Hungary. The sampling times weren't same ones during the summer season therefore the possibility of comparison between the sites can be restricted.

I. Szombathely (UTM:XN23) urban biotops in a major town in Western Hungary (23 June to 01 July 1994);

II. Keszthely (UTM:XM78) urban biotops in a little central Transdanubian town (24 June, 30 June, 10 August 1994);

III. Balatongyörök (UTM:XM78) black pine stand planted in the area of a recultivated dolomite quarry (10 July 1994);

IV. Budapest (UTM:CT56) Sas-hill, Nature Protection area, black pine stand planted in original dolomitic vegetation (21 June 1994, 25 May, 21 June, 15 August 1995);

V. Fülöpháza (UTM:CS89) Kiskunság National Park, black pine stand planted in calciferous sandy-soil (05 May 1993, 18 May 1994, 17 May 1995).

RESULTS

The total number of 2102 spider specimens (255 females, 106 males, 1741 juveniles) belonged to at least 71 species (Table 1).

The species found most frequently can be seen in Table 3. These 10 species comprise 52% of the whole sample.

In Szombathely, the density of samples taken in the centre and in the suburbs showed significant differences (Suburb: d = 60±27.024 specimens/10 branches, city: 22.25±7.65, t_8 = 3.80, The t values was significant at the 1% probability level.).

In Keszthely, at the crossroads in the industrial district of the town, the species diversity of the foliage-dwelling spiders (IV) was significantly lower than that of on the trees of the garden-area (I, II) or in the areas out of the town (III).

Particularly, the jackknifed diversity values and the results of the significancy tests are given in Table 2. All of the t values are significant at the 5% probability level.

DISCUSSION

It can be said on the base of the data of the five sample sites, that black pine offers good conditions for settling down for numerous spiders even in busy town areas.

Despite its uniformity, the spider fauna shows some local characteristics. From the neighbouring habitats, some species that are characteristic of the given geographical area or some adjoining habitats immigrate in a low number of individuals. Accordingly, for example, in the city-centre of Szombathely, *Dictyna civica* from the walls of houses; in Keszthely *Gongylidiellum murcidum* from the neighbouring reeds; in Fülöpháza *Argiope lobata* and *Uloborus walckenarius* from sandy grassland, in Budapest *Sintula spinigera* from the dolomitic vegetation can be the species which were found accidentally.

The examination of spiders dwelling on the foliage of black pine as a special habitat – whose structure, in addition, is permanent – may offer possibility in the future to obtain information on the area surrounding the concrete biotop under research (e.g. geographical location, environmental loading).

TABLE I

Number of foliage-dwelling spiders collected on *Pinus nigra* in Hungary (females/males (juveniles)) I. Szombathely; II. Keszthely; III. Balatongyörök; IV. Budapest; V. Fülöpháza.

Species	I	II	III	IV	V	Σ
Dysderidae						
Harpactea rubicunda (C.L. Koch, 1838)	–/–	–/–	1/–	–/–	–/–(1)	1/–(1)
Segestriidae						
Segestria bavarica C.L. Koch, 1843	–/–(1)	–/–(3)	–/–(1)	–/–	–/–	–/–(5)
Uloboridae						
Hyptiotes paradoxus (C.L. Koch, 1834)	–/–(3)	–/1(1)	–/–(2)	–/–	–/–	–/1(6)
Uloborus walckenarius Latreille, 1806	–/–	–/–	–/–	–/–	–/–(1)	–/–(1)
Tetragnathidae						
Tetragnatha obtusa C.L. Koch, 1837	–/–	–/1	–/–	–/–	–/–	–/1
Tetragnatha spp. juv.	–/–(6)	–/–(39)	–/–	–/–	–/–	–/–(45)
Araneidae						
Agalenatea redii (Scopoli, 1763)	–/–	–/–	–/–	–/–	2/–	2/–
Araneus diadematus Clerck, 1757	–/–(5)	1/2(44)	–/–(9)	–/–(4)	–/–	1/2(62)
Araniella cucurbitina (Clerck, 1757)	1/–	–/–	–/1	1/–	10/4	12/5
Araniella spp. juv.	–/–(1)	–/–(4)	–/–(3)	–/–(1)	–/–(14)	–/–(23)
Argiope lobata Pallas, 1772	–/–	–/–	–/–	–/–	–/–(3)	–/–(3)
Atea sturmi (Hahn, 1831)	–/–	–/1	–/–	–/–	–/–	–/1
Atea sp. juv.	–/–(11)	–/–(26)	–/–(1)	–/–	–/–	–/–(38)
Gibbaranea bituberculata (Walckenaer, 1802)	–/–	–/–	–/–	–/–	2/–	2/–
Gibbaranea omoeda (Thorell, 1870)	1/–	–/–	–/–	–/–	–/–	1/–
Gibbaranea sp. juv.	–/–(2)	–/–	–/–(2)	–/–	–/–	–/–(4)
Mangora acalypha (Walckenaer, 1802)	–/–	–/–(8)	–/–	–/–(3)	4/4(9)	4/4(20)
Zilla diodia (Walckenaer, 1802)	–/–	–/–	–/–	–/–(2)	–/–	–/–(2)
Araneidae spp. juv.	–/–(82)	–/–(20)	–/–(78)	–/–(9)	–/–(51)	–/–(240)
Mimetidae						
Ero aphana (Walckenaer, 1802)	1/–	–/–(1)	–/–	–/–	–/–	1/–(1)
Linyphiidae						
Gongylidiellum murcidum Simon, 1884	–/–	–/1	–/–	–/–	–/–	–/1
Lepthyphantes tenuis (Blackwall, 1852)	1/–	–/–	–/–	1/–	–/–	2/–
Linyphia triangularis (Clerck, 1757)	–/–	1/2	–/–	–/–	–/–	1/2
Linyphia frutetorum (C.L. Koch, 1834)	–/–	–/–	1/–	1/–	3/–	5/–
Meioneta rurestris (C.L. Koch, 1836)	1/–	–/–	–/–	1/–	1/–	3/–
Porrhomma microphthalmum (O.P.-Cambridge, 1871)	–/–	–/–	–/–	1/–	–/–	1/–
Sintula spinigera (Balogh, 1935)	–/–	–/–	–/–	1/–	–/–	1/–
Linyphiinae spp. juv.	–/–(46)	–/–(4)	–/–(44)	–/–(59)	–/–(52)	–/–(205)
Theridiidae						
Anelosimus vittatus (C.L. Koch, 1836)	3/–	–/–	–/–	–/–	–/–	3/–
Dipoena melanogaster (C.L. Koch, 1845)	1/–	1/–	1/–	2/–(7)	1/7(19)	6/7(26)
Enoplognatha lineata (Clerck, 1757)	–/1	–/–	–/–	–/–	–/–	–/1
Enoplognatha sp. juv.	–/–	–/–	–/–(1)	–/–(1)	–/–	–/–(2)
Episinus angulatus (Blackwall, 1836)	–/–	–/–	–/1	–/–	–/–	–/1
Episinus sp. juv.	–/–	–/–	–/–(3)	–/–	–/–(2)	–/–(5)
Neottiura bimaculata (Linné, 1767)	–/–	–/–	–/–	–/–(1)	–/–(2)	–/–(3)
Steatoda bipunctata (linné, 1758)	–/–(1)	–/1	–/–	–/–	–/–(1)	–/1(2)
Theridion sisyphium (Clerck, 1757)	–/–	–/–	–/–	–/1	–/–	–/1
Theridion impressum L. Koch, 1881	1/–	–/–	–/–	–/–	–/–	1/–
Theridion (*sisyphium, impressum* juv.)	–/–(5)	–/–(1)	–/–	–/–(23)	–/–(9)	–/–(38)
Theridion mystaceum L. Koch, 1870	3/–	3/–	–/–	–/–	–/–	6/–
Theridion nigrovariegatum Simon, 1873	–/–	–/–	–/–	3/1(1)	–/–	3/1(1)
Theridion pallens Blackwall, 1834	–/–	–/–	1/–	–/–	–/–	1/–
Theridion pinastri C.L. Koch, 1872	6/4	3/2	5/1	3/1(1)	–/–(6)	17/8(7)
Theridion simile C.L. Koch, 1836	–/–	–/–	–/–	–/–	1/2(1)	1/2(1)

Theridion tinctum (Walckenaer, 1802)	6/–(1)	22/3(25)	5/2	–/–	–/2(33)	33/7(59)
Theridion varians Hahn, 1833	3/–	1/–	–/–	–/–	–/–	4/–
Theridion spp. juv.	–/–(51)	–/–(1)	–/–(6)	–/–(10)	–/–(7)	–/–(75)
Oxyopidae						
Oxyopes sp. juv.	–/–	–/–	–/–	–/–	–/–(4)	–/–(4)
Agelenidae						
Agelena gracilens C.L. Koch, 1841	–/–(5)	–/–	–/–	–/–	–/–	–/–(5)
Dictynidae						
Dictyna civica (Lucas, 1849)	3/2	–/–	–/–	–/–	–/–	3/2
Dictyna pusilla Thorell, 1856	4/–	–/–	–/–	–/–	–/–	4/–
Lathys humilis Blackwall, 1855	10/–	2/–	–/–	–/–	1/–	13/–
Dictyna spp. juv.	–/–(3)	–/–	–/–	–/–	–/–	–/–(3)
Lathys pmta (O.P.-Cambridge, 1863)	–/–	1/–	–/–	–/–	–/–	1/–
Lathys spp. juv.	–/–(24)	–/–(5)	–/–(1)	–/–	–/–	–/–(30)
Anyphaenidae						
Anyphaena accentuata (Walckenaer, 1802)	–/–(2)	–/–	–/–(1)	–/–	2/2	2/2(3)
Clubionidae						
Cheiracanthium mildei L. Koch, 1864	–/–	–/–	–/–	–/1	–/–	–/1
Cheiracanthium sp. juv.	–/–(1)	–/–(7)	–/–	–/–(14)	–/–	–/–(22)
Clubiona genevensis L. Koch, 1867	10/–(35)	4/–(35)	–/–	4/–(4)	12/1(4)	30/1(78)
Clubiona spp. juv.	–/–(27)	–/–(11)	–/–	–/–(2)	–/–	–/–(40)
Gnaphosidae						
Callilepis nocturna (Linné, 1758)	–/–	–/–	–/–	–/–	–/1	–/1
Micaria sp. juv.	–/–(1)	–/–	–/–	–/–	–/–	–/–(1)
Scotophaeus blackwalli (Thorell, 1871)	–/–	–/–	–/–	1/–	–/–	1/–
Scotophaeus scutulatus (L. Koch, 1866)	1/–	–/–	–/–	–/–	–/–	1/–
Scotophaeus spp. juv.	–/–	–/–	–/–	–/–(1)	–/–	–/–(1)
Zelotes sp. juv.	–/–	–/–	–/–	–/–(1)	–/–	–/–(1)
Philodromidae						
Philodromus aureolus (Clerck, 1757)	–/–	–/–	–/–	–/1	–/1	–/2
Philodromus cespitum (Walckenaer, 1802)	2/4	–/–	–/–	2/2	–/–	4/6
Philodromus collinus C.L. Koch, 1835	–/3	1/–	1/–	–/–	–/–	2/3
Philodromus margaritatus (Clerck, 1757)	1/–	–/–	–/–	–/–	2/–	3/–
Philodromus praedatus (O.P.-Cambridge)	–/1	–/–	–/–	–/–	–/–	–/1
Philodromus spp. juv.	–/–(198)	–/–(59)	–/–(51)	–/–(92)	–/–(53)	–/–(453)
Tibellus sp. juv.	–/–	–/–	–/–	–/–(1)	–/–	–/–(1)
Thomisidae						
Heriaeus mellottei Simon, 1866	–/–	–/–	–/–	1/2	–/–	1/2
Misumena vatia (Clerck, 1757)	–/–	–/–	–/–	–/–	–/–(1)	–/–(1)
Tmarus piger (Walckenaer, 1802)	–/–	–/–(1)	–/–	–/–	–/–(1)	–/–(2)
Xysticus spp. juv.	–/–(19)	–/–(6)	–/–(9)	–/–(20)	–/–	–/–(54)
Salticidae						
Dendryphantes rudis (Sundevall, 1832)	–/–	4/–(11)	–/–	–/–	5/1(11)	9/1(22)
Eris nidicolens (Walckenaer, 1802)	15/7(22)	6/2(37)	5/–(6)	7/1(13)	6/10(10)	39/20(88)
Euophrys obsoleata (Simon)	–/–	–/–	1/–	–/–	–/–	1/–
Euophrys sp. juv.	–/–	–/–	–/–(2)	–/–	–/–	–/–(2)
Evarcha falcata (Clerck, 1757)	–/–	–/–	–/–	–/–	1/–	1/–
Heliophanus cupreus (Walckenaer, 1802)	–/–	–/–	–/–	–/–	2/–	2/–
Heliophanus spp. juv.	–/–	–/–	–/–	–/–(19)	–/–	–/–(19)
Marpissa muscosa (Clerck, 1757)	–/–	–/–(1)	–/–	–/–	2/–(7)	2/–(8)
Philaeus chrysops (Poda, 1761)	–/–	–/–	–/–	–/–(1)	–/–	–/–(1)
Salticus scenicus (Clerck, 1757)	–/–	–/–	–/–	–/–	–/1	–/1
Salticus zebraneus (C.L. Koch, 1837)	6/2	8/7	8/–	2/2	–/8	24/19
Salticus spp. juv.	–/–(2)	–/–(8)	–/–(7)	–/–(5)	–/–(3)	–/–(25)
	80/24(554)	58/23(358)	29/5(227)	31/12(295)	57/42(307)	2102

TABLE 2

Jackknifed estimates (J) of the Shannon-Wiener indices. The t statistics relate to the differences between the J values belonging to the areas and to the industrial district, respectively (Keszthely).

	J	t
I. garden area # 1	2.7740	4.270
II. garden area # 2	2.7557	4.779
III. areas out of the town	2.5445	2.559
IV. industrial district	2.1589	–

TABLE 3

The 10 most abundant spider species/genera on *Pinus nigra* (S.ISA KENDALL 1962).

		S. ISA
1.	*Philodromus* spp. juv.	1
2.	*Eris nidicolens*	0.94
3.	*Salticus zebraneus*	0.85
4.	*Theridion tinctum*	0.77
5.	*Theridion pinastri*	0.76
6.	*Clubiona geneveusis*	0.71
7.	*Araniella cucurbitina*	0.65
8.	*Araneus diadematus*	0.64
9.	*Theridion (sisyphium, impressum)* juv.	0.55
10.	*Dipoena melanogaster*	0.51

REFERENCES

ADAMS, J.E. & MCCUNE, E.D. 1979. Application of the generalized jackknife to Shannon's measure of information used as an index of diversity, pp. 117–131. *In:* Ecological Diversity in Theory and Practice (J.F. GRASSLE *et al.*, ed.), *Fairland MD: Internat Publishing House.*

BALOGH, J. 1935. A Sashegy pókfaunája. *Sárkány Nyomda.* 60 pp.

GUNNARSSON, B. 1988. Spruce-living spiders and forest decline, the importance of needle-loss. *Biological Conservation* 43: 309–319.

IZSAK, J. 1994. Applying the jackknife method to significance test of diagnostic diversity. *Methods of Information in Medicine* 33: 214–219.

JENNINGS, D.T. 1987. Coniferous-habitat associations of spiders (Araneae) on red spruce foliage. *Journal of Arachnology* 14: 315–326.

KENDALL, M.G. 1962. Rank correlation methods. *London*, 199 pp.

KNOFLACH, B. & BERTRANDI, F. 1993. Spinnen (Araneidae) aus Klopffängen an *Juniperus* und *Pinus* in Nord-Tirol. *Berichte des Naturwissenschaftlich–Medizinischen Vereins in Innsbruck* 80: 295–302.

KOLOSVÁRY, G. 1933. Beiträge zur Faunistik und Ökologie der Tierwelt der Ungarländische Junipereten. *Zeitschrift für Morphologie und Ökologie der Tiere* 28(1): 52–63.

KOLOSVÁRY, G. 1935. Neue Beiträge zur Biologie der Tierwelt der Ungarländische Junipereten. *Folia Zoologica et Hydrobiological* 2(7): 203–216.

MASON, R.R. 1992. Populations of arboreal spiders (Araneae) on douglas-firs and true firs in the interior Pacific northwest. *Environmental Entomology* 21(1): 75–80.

MEUSEL, H., JÄGER, E. & WEINERT, F. 1965. Vergleichende Chorologie der Zentraleuropäischen Flora II. *Gustav Fischer Verlag, Jena*, p. 212.

SIMON, U. 1995. Untersuchung der Stratozönosen von Spinnen und Weberknechten (Arachn.: Araneae, Opilionida) an der Waldkiefer (*Pinus sylvestris* L.). *Wissenschaft & Technik Verlag.* 142 pp.

SZINETÁR, Cs. 1992. Spruce as spider-habitat in urban ecosystem I. *Folia Entomologica Hungarica* 53: 179–188.